WHAT IS CLAIMED IS:

1. A DC-DC converter comprising:

a transformer having a primary side and a secondary side;

at least one power switch provided on the primary side of said transformer, a switching operation of said at least one power switch causing the secondary side of said transformer to output AC power;

a rectifying-and-smoothing circuit connected to the secondary side of said transformer and converting the output AC power into DC power, said rectifying-and-smoothing circuit including an inversely driven synchronous rectifier including a MOSFET having an ON/OFF switching operation that is inverse with respect to that of said at least one power switch;

a power switch driving circuit for alternately outputting an ON signal and an OFF signal to said at least one power switch in order to control the switching operation of said at least one power switch;

an ON-timing delay circuit for detecting output of the ON signal from said power switch driving circuit to said at least one power switch and delaying ON timing of said at least one power switch by hindering the start of an ON operation of said at least one power switch based on the ON signal;

an early turnoff circuit for turning off the inversely driven synchronous rectifier by outputting an OFF signal to said inversely driven synchronous rectifier upon detecting output of the ON signal from said power switch driving circuit to said at least one power switch, in a period in which the start of the ON operation of said at least one power switch is delayed by said ON-timing delay circuit; and

a delay eliminating circuit for eliminating a delay operation of said ON-timing delay circuit when detecting turnoff of the inversely driven synchronous rectifier by detecting a decrease in the gate voltage of the inversely driven synchronous rectifier.

2. A DC-DC converter according to claim 1, wherein said ON-timing delay circuit is provided on a signal path extending to said at least one power switch from said power switch driving circuit.

3. A DC-DC converter according to claim 1, wherein said DC-DC converter is a forward converter, and the inversely driven synchronous rectifier is a commutating synchronous rectifier.

4. A DC-DC converter according to claim 1, wherein said early turnoff circuit includes a pulse transformer in which a signal representing the output of the ON signal from said power switch driving circuit to said at least one power switch is converted into a pulse signal and which turns off the inversely driven synchronous rectifier by transmitting the pulse signal from the primary side to secondary side of said transformer.

5. A DC-DC converter according to claim 4, wherein said ON-timing delay circuit is configured to delay the ON timing of said at least one power switch by using excitation inductance of the pulse transformer in said early turnoff circuit, and said delay eliminating circuit is configured to eliminate the delay operation of said ON-timing delay circuit, which is caused by the excitation inductance of said transformer, by supplying the pulse transformer with a signal representing turnoff of the inversely driven synchronous rectifier.

6. A DC-DC converter according to claim 1, further comprising a power-switch-ON-inducement circuit which expedites a turn-on operation of said at least one power switch by outputting an ON inducement signal to said at least one power switch when the delay operation of said ON-timing delay circuit is eliminated by said delay eliminating circuit.

7. A DC-DC converter according to claim 1, wherein said ON-timing delay circuit includes a delay adjusting circuit for adjusting delay-operation termination timing.

8. A DC-DC converter according to claim 1, wherein the at least one power switch is an N-channel MOSFET.

9. A DC-DC converter according to claim 1, wherein the delay eliminating circuit includes a resistor and a capacitor.

10. A DC-DC converter according to claim 3, wherein the early turnoff circuit turns off the commutating synchronous rectifier in a period in which the ON timing of the at least one power switch is delayed by the delay operation of the ON-timing delay circuit, whereby a short-circuiting current is prevented from being generated by a delay in the turnoff of the commutating synchronous rectifier.

11. A DC-DC converter according to claim 10, wherein as soon as the commutating synchronous rectifier is turned off by the delay eliminating circuit, the delay operation of the ON-timing delay circuit is eliminated.

12. A DC-DC converter according to claim 1, wherein the early turnoff circuit includes a diode, a pulse transformer, and an N-channel MOSFET.

13. A DC-DC converter according to claim 1, wherein the transformer is a pulse transformer that includes a primary coil and a secondary coil.

14. A DC-DC converter according to claim 1, wherein the delay eliminating circuit includes resistors, a capacitor, and a PNP transistor.

15. A DC-DC converter according to claim 1, further comprising a delay adjusting circuit including at least one resistor.

16. A DC-DC converter according to claim 1, wherein the early turnoff circuit includes a pulse transformer and an N-channel MOSFET.

17. A DC-DC converter according to claim 16, wherein the pulse transformer includes a primary coil and a secondary coil.

18. A DC-DC converter according to claim 1, wherein the delay eliminating circuit includes a P-channel MOSFET.

19. A DC-DC converter according to claim 1, wherein the DC-DC converter is one of a forward type, a flyback type, a push-pull type having a plurality of power switches, and a half bridge type.